

REMARKS

In response to the Official Action of August 18, 2003, claims 1, 4, 5, 6, 8 and 9 have been amended and claims 10-12 have been cancelled without prejudice.

Referring now to paragraphs 2 and 3 of the Official Action, the language to which the Examiner objected in claims 4-6 regarding the preferable central angle has been deleted from claims 4-6; therefore the rejection under 35 USC §112, second paragraph, has been overcome.

Referring now to paragraph 4 of the Official Action, the objections concerning claims 8 and 9 have been corrected in the present amendment.

Referring now to paragraphs 5-7 of the Official Action, it is respectfully submitted that claim 1 is not suggested by U.S. Patent No. 4,521,899 (*Finkenzeller et al.*) in view of U.S. Patent No. 4,783,793 (*Virta et al.*). More specifically, the Examiner states at paragraph 7 that *Finkenzeller et al.* discloses a panoramic dental X-raying method comprising an X-ray beam (12) from a radiation source (3) provided in a rotating arm (1) with guiding the beam through the dental arch to a recorder (2) disposed opposite the radiation source in the arm in order to form an image; rotating the arm so as to form an image of substantially the entire width of the dental arch; and limiting the X-ray beam by a shutter in the front area of the dental arch as compared to the two sides of the arch in order to increase the thickness in the front area of the layer of which a sharp image is formed. The Examiner cites column 3, lines 25-31, in support thereof. It is correct that *Finkenzeller et al.* discloses a common feature with the present invention, i.e., the narrowing of the X-ray beam in the front area of the dental arch with the purpose to increase the thickness of the layer that is sharply imaged. However, in *Finkenzeller et al.* the narrowing of the beam by the shutter reduces the amount of radiation forming the image and thus would normally produce a darker image. This is true for all similar X-ray applications. In order to compensate for this darkening, *Finkenzeller et al.* increases the radiation intensity accordingly, whereas the solution of the present invention is to retard the movement of the X-ray beam in the front area of the dental arch where the beam is being narrowed. The Examiner is of the opinion that *Finkenzeller et al.* discloses an equivalent method to compensate for the radiation exposure by increasing the radiation intensity when the slit width becomes smaller, as set forth in *Finkenzeller et al.* at column 3, lines 38-44.

It is respectfully submitted that the use of increased X-ray radiation to compensate for darkening associated with the narrower slit in the frontal area of the arch does not make the present invention obvious. To the contrary, the compensation for the normal darkening associated with a narrower beam is achieved in an indirect manner in the present invention, not by acting on the radiation source intensity directly but by control of the rotating arm which serves to move the beam. It is respectfully submitted that this difference is significant since the present invention maintains the radiation intensity at a substantially constant level which is safe for the patient. The proposal in *Finkenzeller et al.*, to the contrary, increases the radiation intensity during exposure of the frontal arch and thereby creates a potential safety hazard to the patient due to this increased radiation, especially if there was any malfunction of the rotating arm. Furthermore, *Finkenzeller et al.* makes absolutely no suggestion that control of the rotating arm to compensate for darkening associated with the narrower slit would be desirable or possible. Presently amended claim 1 makes clear that the X-ray beam maintains a substantially constant intensity throughout the entire panoramic dental X-raying of the dental arch and therefore is clearly distinguished over the methodology disclosed in *Finkenzeller et al.*. Support for this amendment is found in the application as filed including page 3, lines 13-20, wherein it is stated that it is necessary to retard the movement of the X-ray beam in the front area of the dental arch relative to the two sides of the arch in order to obtain a substantially homogenous dark tone of the image over the entire length of the dental arch. Clearly, such retardation of the movement of the X-ray beam is for compensation for the reduction in the X-ray beam radiation due to the narrower X-ray beam, which therefore implies that the X-ray beam is maintained at a substantially constant intensity.

This amendment to claim 1 is also supported in the specification at page 6, lines 4-13, wherein it discloses that the X-ray radiation source produces an X-ray beam 12 with no reference to varying the intensity of the beam as the arm is rotated. Such constant radiation intensity for dental X-ray radiation sources is well known in the art.

The Examiner goes on at paragraph 7 of the Official Action to state that U.S. Patent No. 4,783,793 (*Virta et al.*) discloses specifically retarding movement of an X-ray beam to compensate for radiation exposure when X-raying different jaw sizes, citing column 3, lines 24-33. The Examiner states that it would therefore be obvious to one of ordinary skill in the art at the time the invention was made to modify *Finkenzeller et al.*'s panoramic method to include retarding

movement of the X-ray beam in the front area of the dental arch compared to the two sides of the dental arch because this would be functionally equivalent to increasing the radiation intensity in the front area of the dental arch. It is respectfully submitted, however, that *Virta et al.* does not bridge the gap between the present invention as claimed in amended claim 1 in *Finkenzeller et al.* Although it is correct that *Virta et al.* discloses an X-ray dental imaging system which is provided with means for enabling changes in the speed of the rotary motion of the arm carrying the radiation means, the aim of this system is to adapt the imaging to different sizes and shapes of dental arches by controlling the location of the sharp focus. In *Virta et al.*, figures 4 and 5 show that the unbroken lines A and D represent normal arch sizes while dotted lines B, C, E and F show deviations that the system is adapted to follow by means of controlling the speed of rotation as well as the speed of the film. Even in figure 4, it should be appreciated that dotted lines B and C do not indicate the limits of a sharply imaged layer around the central line, but rather show the position of the central line in various instances as the dental arches of different individuals have different sizes. Thus, as opposed to the present invention, the thickness of the sharp layer is not an issue at all in *Virta et al.*. The present invention thus relies on imaging geometry in which the axis of rotation of the arm is brought closer to the teeth in the front area of the arch, with narrowing of the sharp layer in order to increase the thickness of the layer that is sharply imaged, as disclosed at page 1, lines 21-29. In *Virta et al.*, the distance between the layer being imaged and the film and therefore the distance between the axis and the layered image are kept essentially constant (see column 4, lines 56-60). Thus, *Virta et al.* does not teach or suggest narrowing the beam in the front area of the dental arch in order to increase the thickness of the layer that is sharply imaged. Therefore, there is no suggestion or motivation made in *Virta et al.* to guide a person skilled in the art so as to consider *Virta et al.* when seeking a solution to the problem of darkening of the image that is concomitant with a narrowed beam. It is therefore respectfully submitted that the combination as recited at paragraph 7 of the Official Action of *Finkenzeller et al.* with *Virta et al.* would not be suggested by either of these references or by the state of the art in general.

For all of the foregoing reasons, it is respectfully submitted that amended claim 1 is distinguished over the cited art.

For similar reasons it is respectfully submitted that the rejection of claims 2 and 3 at paragraph 8 of the Official Action is overcome due to the inappropriateness of combining

Finkenzeller et al. with *Virta et al.* and furthermore since claim 1 as amended, from which claims 2 and 3 depend, is distinguished over the cited art. It is therefore respectfully submitted that claims 2 and 3 are also allowable.

Referring to paragraph 9 of the Official Action, it is respectfully submitted that amended claim 4 is not suggested by *Finkenzeller et al.* due to its dependency upon amended claim 1, which is believed to be distinguished over *Finkenzeller et al.*

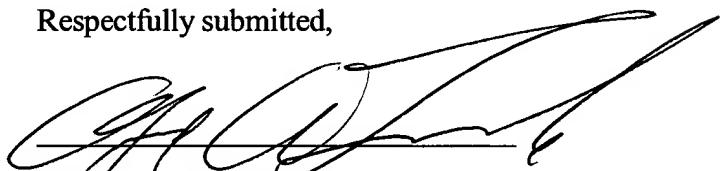
Referring now to paragraph 10 of the Official Action, it is respectfully submitted that amended claim 5 is not obvious in view of *Virta et al.* for the reasons cited above and due to the fact that claim 5 is ultimately dependent upon amended claim 1. Similar arguments pertain to amended claim 6, claim 7, and amended claims 8 and 9. It is therefore respectfully submitted that the rejection of these claims at paragraphs 11, 12 and 13 are overcome.

Since claims 10, 11 and 12 have been cancelled without prejudice, the rejection of these claims at paragraphs 16, 17 and 18 is deemed to be moot.

For all of the foregoing reasons, it is respectfully submitted that the present application as amended is now in condition for allowance and such action is earnestly solicited.

The Examiner is invited to contact applicant's attorney at the number below if there are any questions.

Respectfully submitted,



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Dated: November 18, 2003

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